

Fermi National Accelerator Laboratory

Capture cavity ii update

Timothy W. Koeth
July 10, 2006



Photograph By Tim Koeth

Rutgers

The State University of New Jersey

CCII Calendar

Started Nov 2004

Tested CCII at DESY June 2005

Cryovessel & Cavity preparation: Nov 2004 → Dec 2005
(both at DESY & FNAL)

Approval for RF on Jan 17th (2006)

RF into Input Coupler Jan 17th

“Serious” Coupler Processing: Feb - March

Cool Down March 13th

CC2 Testing: Gradients, Dark Current, LLRF, Piezo & More

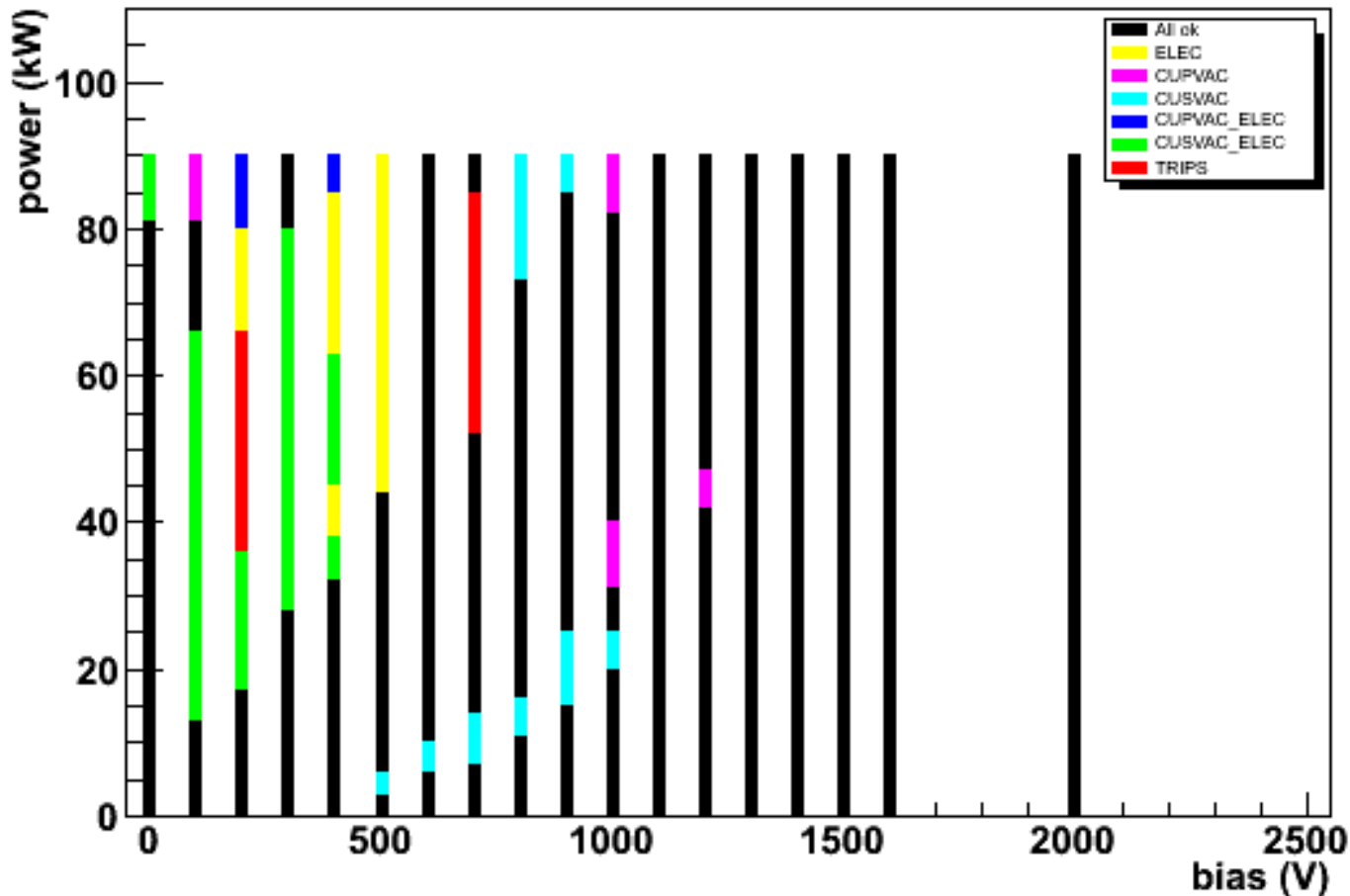
Warm up to begin 1.8K Installation: March 29th

Installed rebuilt Klystron ~280kW: May 20th

Cool Down to 1.8K & RF operation began July 6th

Input Coupler Processing

Multipactoring map after processing when limited to 90kW of RF



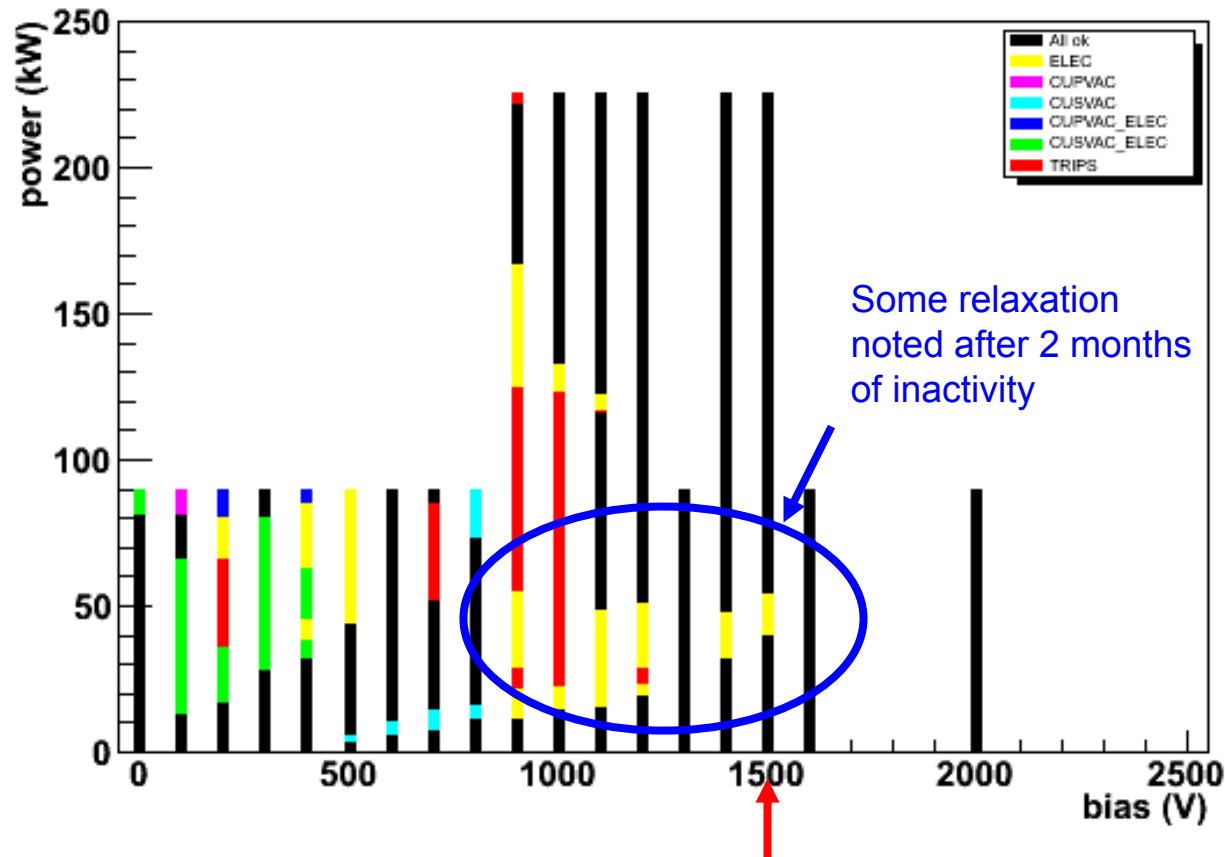
Black = good

Color = no good

Input coupler processing

The rebuilt klystron extended our power capacity from 90kW to 225kW

CC2 Coupler

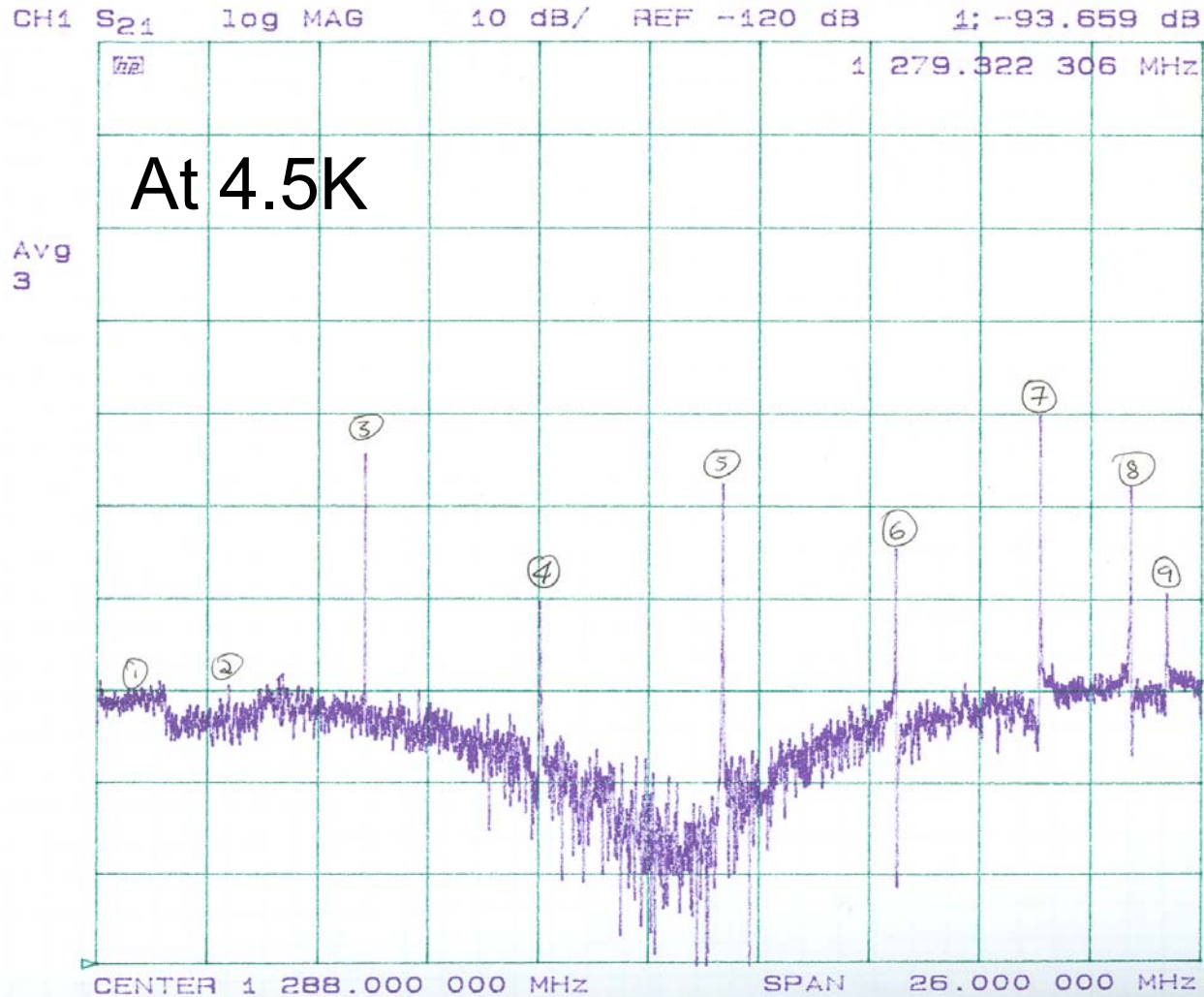


Black = good

Color = no good

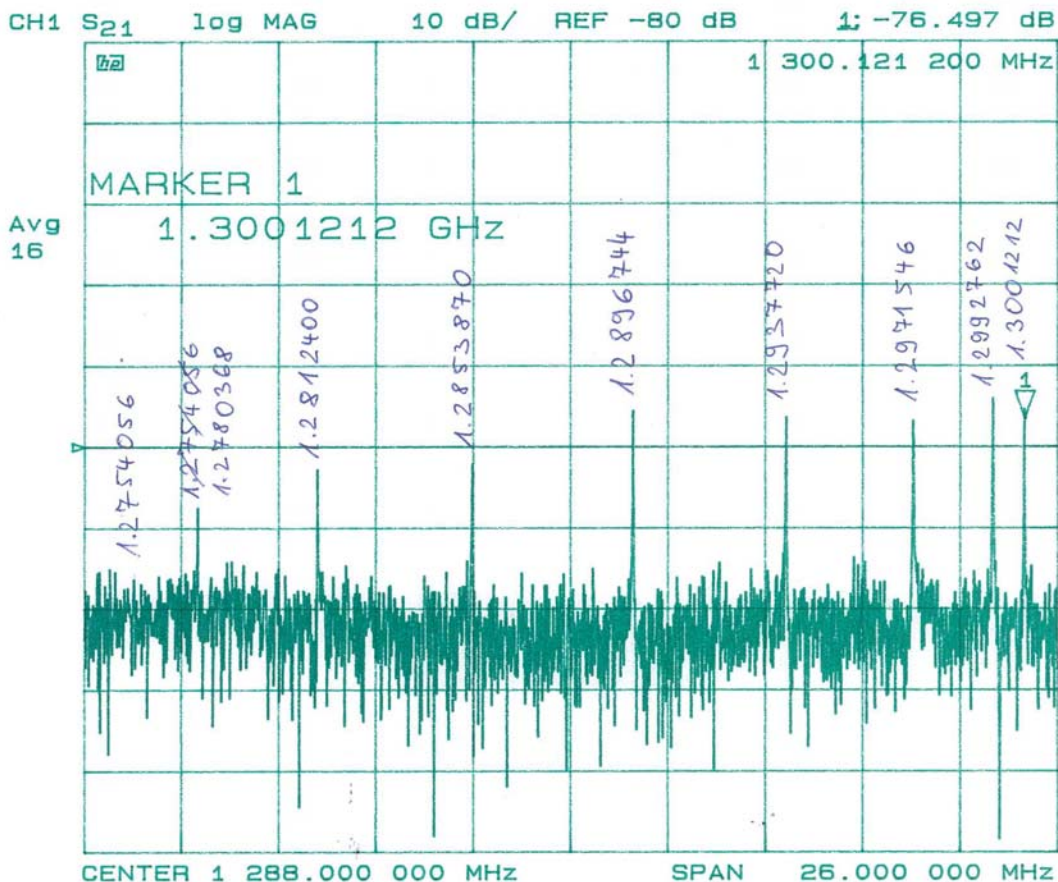
Remember this is off resonance, standing wave with 100% reflected power.

Frequency Measurements



Frequency Measurements

At 1.8K



π mode:

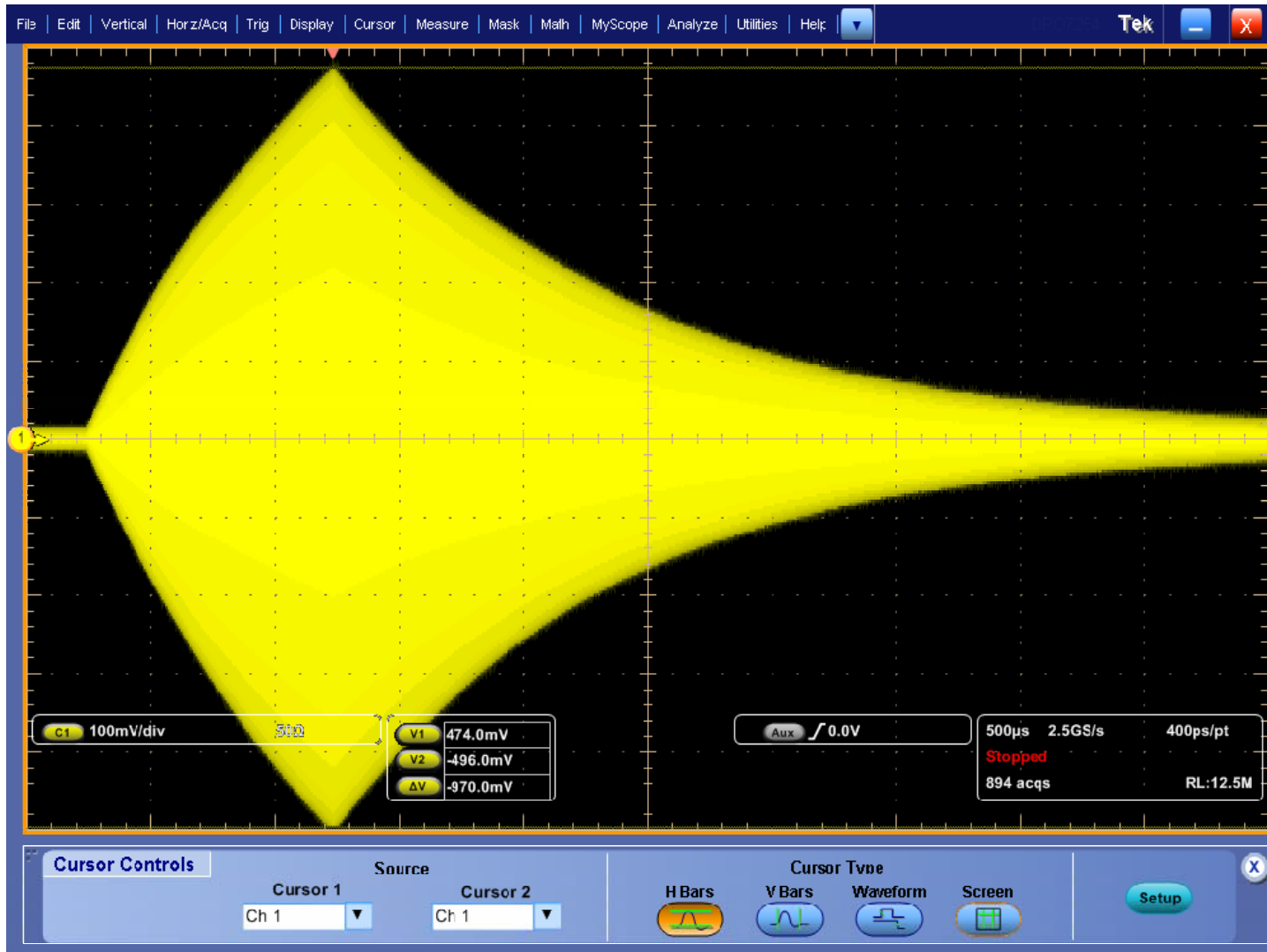
4.5K (atm): 1.3001651 GHz

1.7K(12Torr): 1.3001212 GHz

$$\Delta f = 44\text{kHz}$$

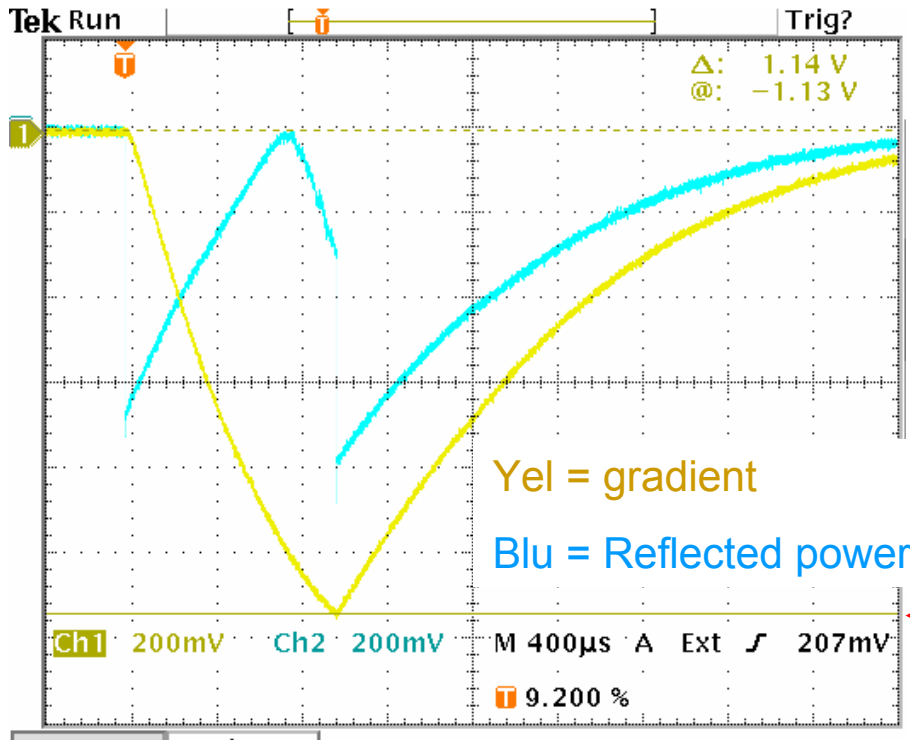
Peak Gradient Measurement

Friday July 7th, 2006



Peak Gradient Measurement

Friday July 7th, 2006



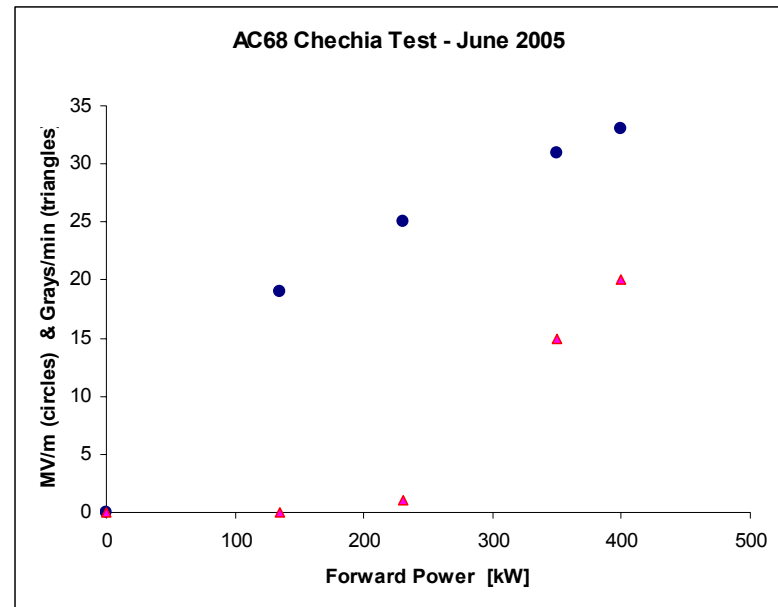
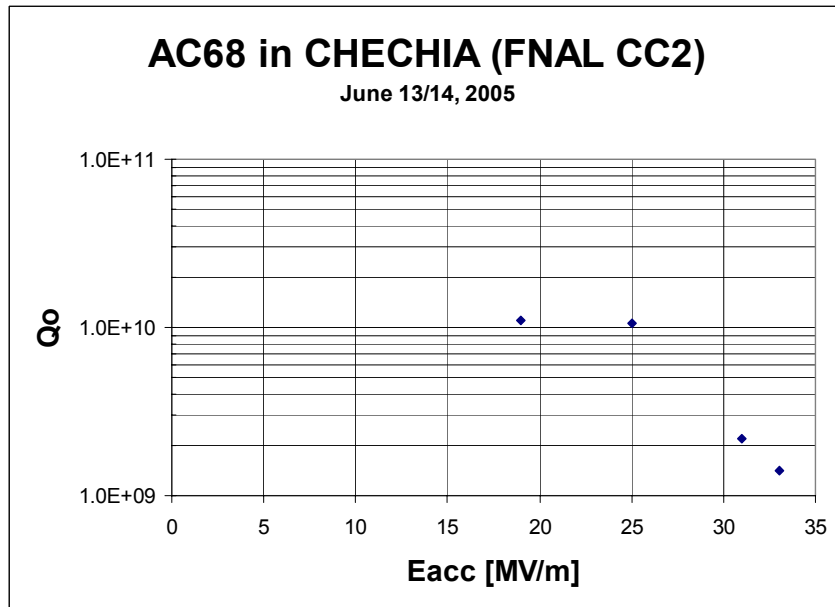
Lorentz Force Detuning observed !

Higher peak gradient required lower frequency ($\sim 100\text{Hz}$) to minimize average reflected power.

Needs more investigation !

31.3MV/m
(+/- 1MV/m)

CC2 DESY Results - June '05



PEAK GRADIENT

33MV/m

20 Gy/min of X-rays(2 Rad/min)

REQUIRED OPERATING GRADIENT

25MV/m

(~ 1 Gy/min)

Next Steps

- LLRF control: maximum flat top gradient
- Dark Current and Radiation measurement
- Dynamic Heat Load test $\rightarrow Q_0$
- Testing of new FNAL interlocks
- Automation of processing
- Dedicated time to LLRF & Piezo Tuner
- Vibration Studies